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Notes:

1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 04/14/2009 / Priority: 1. Electronic engineering / 2. Technical term

FULL CONTENTS

[Claim(s)]

[Claim 1]A booster antenna for IC cards which forms a magnetization coil which carries out electromagnetic coupling to an antenna of an IC chip, and a booster coil which carries out series connection to this magnetization coil on a card substrate, and is characterized by said booster coil having an effective area product larger than said magnetization coil.

[Claim 2]A booster antenna for the IC cards according to claim 1 forming said magnetization coil and a booster coil spirally [two dimensions], respectively.

[Claim 3]A booster antenna for the IC cards according to claim 2, wherein said magnetization coil and a booster coil make the direction of a volume the same.

[Claim 4]Claim 1 installing an IC chip in said magnetization coil thru/or Claim 3 are the booster antennas for IC cards of a description either.

[Claim 5]Claim 1 forming a capacitor for resonance in said booster coil thru/or Claim 4 are the booster antennas for IC cards of a description either.

[Claim 6]As for said magnetization coil, Claim 1 forming in the exterior of said booster coil thru/or Claim 5 are the booster antennas for IC cards of a description either.

[Claim 7]A booster antenna for the IC cards according to claim 6 providing said magnetization coil for two or more IC chips of every on a card substrate.

[Claim 8]As for said magnetization coil, Claim 1 forming in an inside of said booster coil thru/or Claim 5 are the booster antennas for IC cards of a description either.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the booster antenna for IC cards which can be used conveniently for the IC card of uncontacted type.

[0002]

[Description of the Prior Art]The IC chip for communication of antenna loading type is built into the IC card of uncontacted type. However, what is called an IC tag shall be included with an IC card here.

[0003]The antenna which suits using frequency with the tip body for communication at the IC chip of antenna loading type is carried in one. Then, the antenna of an IC chip can receive the electric wave from the external leader writer, and can supply the electric power for an operation to a tip body, and required data communication can be realized between a tip body and the leader writer.

[0004]

[Problem to be solved by the invention]Since the antenna of the IC chip was formed very small when based on this conventional technology, sufficient transmission and reception sensitivity could not be obtained, but there was a problem that the communication-of-information distance by an IC card tended to be insufficient.

[0005]Then, the purpose of this invention is to provide the booster antenna for IC cards which can aim at expansion of communication-of-information distance by providing the magnetization coil which carries out electromagnetic coupling to the antenna of an IC chip, and a booster coil in view of the problem of this conventional technology.

[0006]

[Means for solving problem]The constitution of this invention for attaining this purpose forms the magnetization coil which carries out electromagnetic coupling to the antenna of an IC chip, and the booster coil which carries out series connection to a magnetization coil on a card substrate, and a booster coil makes it that gist for an effective area product to be larger than a magnetization coil.

[0007]A magnetization coil and a booster coil can be formed spirally [two dimensions], respectively, and can make the direction of a volume the same.

[0008]An IC chip may be installed in a magnetization coil and the capacitor for resonance may be formed in a booster coil.

[0009]A magnetization coil may be formed in the exterior of a booster coil, and may be provided for two or more IC chips of every on a card substrate.

[0010]A magnetization coil may be formed in the inside of a booster coil.

[0011]

[Function]Since electromagnetic coupling of the magnetization coil is carried out to the antenna of an IC chip and series connection is carried out to the booster coil when based on the constitution of this invention, a booster coil can be operated as an external antenna of an IC chip. It is because the booster coil can receive the electric wave from the external leader writer, and can transmit it to the antenna of an IC chip via a magnetization coil, the electric wave from the antenna of an IC chip can be received via a magnetization coil and it can transmit to the external leader writer.

[0012]When receiving the electric wave from the antenna of an IC chip, the magnetization coil can act as a secondary coil to the antenna of an IC chip, and can carry out a signal amplification operation

according to both number ratio of turns. The booster antenna can realize sufficiently high transmission and reception sensitivity easily by forming in a bigger effective area product than a magnetization coil.

[0013]The magnetization coil and booster coil which are formed spirally [two dimensions] can be formed in the predetermined number of turns, respectively, and can realize a required inductance.

[0014]A magnetization coil and the booster coil can make the direction of a volume the same, and can form it easily with one electric conduction pattern or a wire rod.

[0015]If an IC chip is installed in a magnetization coil, electromagnetic coupling of the magnetization coil can be carried out densely enough to the antenna of an IC chip.

[0016]For example with a parallel pattern, the capacitor for resonance formed in a booster coil can realize necessary capacity with sufficient accuracy, and can make an external capacitor unnecessary.

[0017]If a magnetization coil is formed in the exterior of a booster coil, the booster coil can make the effective effective area product the maximum.

[0018]By carrying out series connection to a common booster coil, the magnetization coil provided for two or more IC chips of every is effective in order to be able to coordinate two or more IC chips, and to be able to operate them, for example, to enlarge memory capacity of an IC card. Data communication of each IC chip can be carried out via the magnetization coil corresponding to each, and a common booster coil the external leader writer and mutual.

[0019]When forming a magnetization coil in the inside of a booster coil, a magnetization coil and a booster coil can be compactly packed into the size of a booster coil. An IC chip shall provide in a magnetization coil also at this time.

[0020]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described by Drawings.

[0021]The booster antenna for IC cards forms the magnetization coil L1 and the booster coil L2 which carries out series connection to the magnetization coil L1 on card substrate CD (drawing 1, drawing 2).

[0022]Card substrate CD is formed in the shape of [thin] a card of insulating materials, such as a paper material and a synthetic resin material. The magnetization coil L1 and the booster coil L2 are formed as a two-dimensional spiral electric conduction pattern on card substrate CD by techniques, such as printing and etching, respectively. As for the magnetization coil L1 and the booster coil L2, the direction of a volume is arranged identically. It is formed in the exterior of the booster coil L2, and the magnetization coil L1 is the magnetization coil L1. Inside, tip body IC and IC chip CP which carries the antenna A are installed.

[0023]The booster coil L2 is formed in a larger effective area product than the magnetization coil L1, and serves as many numbers of turns from the magnetization coil L1. Booster coil L2 The capacitor C

for resonance is formed inside. The capacitor C can secure necessary capacity by forming the parallel pattern of predetermined length and a prescribed interval via the electric conduction pattern of the shape of **** which carries out for relativity.

[0024] Electromagnetic coupling of the magnetization coil L1 is carried out to the antenna A of IC chip CP, and series connection of the booster coil L2 is carried out to the magnetization coil L1 via detour pattern B-2 of the outside of the jumper wire B1 and the booster coil L2, and the jumper wire B3 with the capacitor C. However, the numerals M of drawing 2 show the electromagnetic coupling of the antenna A and the magnetization coil L1. Electromagnetic coupling of the magnetization coil L1 is carried out to an equivalent for the outside size of IC chip CP densely enough to the antenna A by making an effective area product small.

[0025] While the booster coil L2 receives the electric wave S1 from the leader writer which the exterior does not illustrate, supplies high-frequency power to tip body IC of IC chip CP via the magnetization coil L1 and the antenna A and starts tip body IC, The data contained in the electric wave S1 can be transmitted to tip body IC. At this time, the antenna A is magnetized with the magnetization coil L1. IC chip CP sends the electric wave which contains required data via the antenna A, and transmits it to the booster coil L2 via the magnetization coil L1, and the booster coil L2 is sent out to the leader writer as the electric wave S2. That is, via the magnetization coil L1 and the antenna A, the booster coil L2 can operate as an external antenna for IC chip CP, and can expand the communication-of-information distance of IC chip CP.

[0026] In the above explanation, the magnetization coil L1 and the booster coil L2 may be formed on card substrate CD using one wire rod which has an insulating film (drawing 3). The capacitor C for resonance is the booster coil L2 about the both ends of a wire rod. It can form in necessary capacity by pulling out inside and forming in the parallel pattern of predetermined length and a prescribed interval (the figure). The capacitor C is the booster coil L2. It may form with the spiral parallel pattern formed inside (drawing 4). When providing band-like magnetic storage partial CD1 in card substrate CD (drawing 5), the booster coil L2 shall be formed so that magnetic storage partial CD1 may not be crossed.

[0027]

[Other embodiments] The magnetization coil L1 can be formed for every two or more IC chip CP on card substrate CD, and CP (drawing 6, drawing 7). The magnetization coil L1 and L1 correspond to the common booster coil L2, and they are each magnetization coil L1. IC chip CP is installed inside. Series connection of the booster coil L2 is carried out to the magnetization coil L1 and L1 with the capacitor C via the jumper wire B4, detour pattern B5, jumper wire B6, the detour pattern B7, and the jumper wire B8. That is, IC chip CP and CP can use the common booster coil L2 via the magnetization coil L1, respectively, and data communication can be carried out with the external leader writer. In drawing 6 and drawing 7, IC chip CP and the magnetization coil L1 may provide the two or more arbitrary numbers of groups.

[0028]The magnetization coil L1 may be formed in the inside of the booster coil L2 (drawing 8, drawing 9). Between the magnetization coil L1 and the booster coil L2, the capacitor C1 for resonance, C2, C3, and C4 carry out parallel connection, and they are formed. Magnetization coil L1 IC chip CP is installed inside and the auxiliary coil L1a of a single loop and L1a are formed between the magnetization coil L1 and IC chip CP.

[0029]Series connection of the booster coil L2 is carried out to the magnetization coil L1 with the capacitor C1, C2, C3, and C4 via the jumper wire B9a and B9b. The auxiliary coil L1a and L1a can carry out electromagnetic coupling of the magnetization coil L1 to the antenna A of IC chip CP densely while they enlarge substantially width of the conductor pattern of the magnetization coil L1 and raise apparent Q. The magnetization coil L1 can miniaturize whole size in an equivalent for the outside of the booster coil L2 by forming in the inside of the booster coil L2.

[0030]

[Effect of the Invention][by forming the magnetization coil which carries out electromagnetic coupling to the antenna of an IC chip, and the booster coil which carries out series connection to a magnetization coil on a card substrate according to this invention, as explained above] Since the booster coil can operate as an external antenna of an IC chip via a magnetization coil, it has the outstanding effect that the communication-of-information distance of an IC card is expandable.

[Brief Description of the Drawings]

[Drawing 1]Entire configuration plane explanatory view

[Drawing 2]Representative circuit schematic

[Drawing 3]The drawing 1 equivalent figure (1) showing other embodiments

[Drawing 4]The ** type top view (1) showing other embodiments

[Drawing 5]The ** type top view (2) showing other embodiments

[Drawing 6]The ** type top view (3) showing other embodiments

[Drawing 7]The representative circuit schematic of drawing 6

[Drawing 8]The drawing 1 equivalent figure (2) showing other embodiments

[Drawing 9]The representative circuit schematic of drawing 8

[Explanations of letters or numerals]

CD -- Card substrate

CP -- IC chip

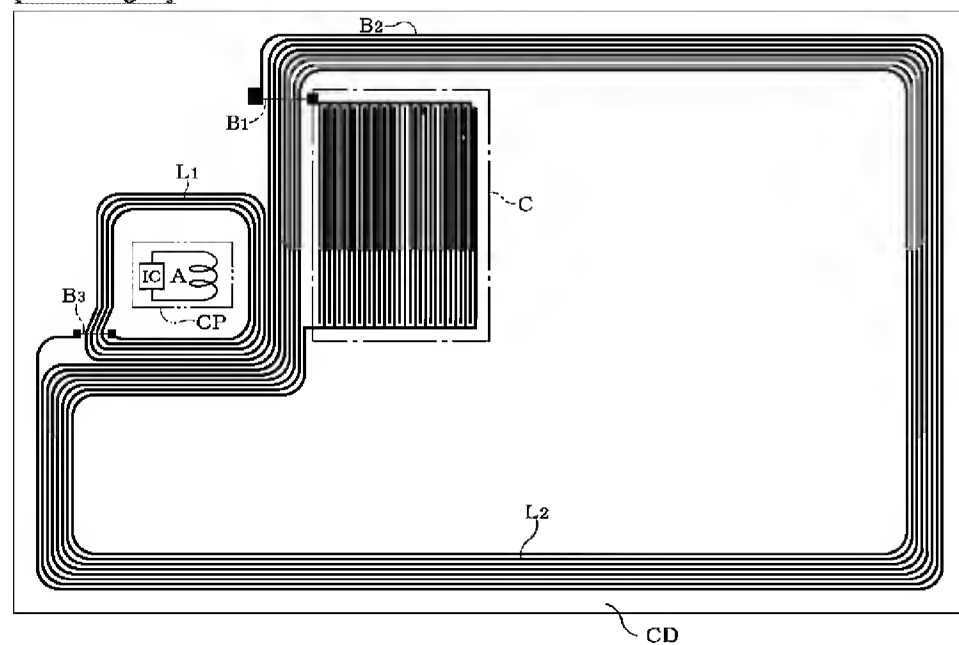
A -- Antenna

L1 -- Magnetization coil

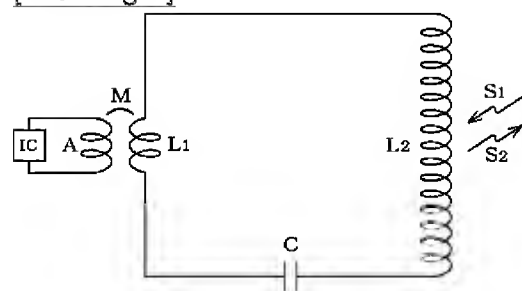
L2 -- Booster coil

C -- Capacitor

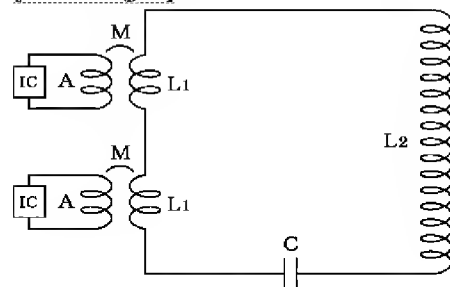
[Drawing 1]



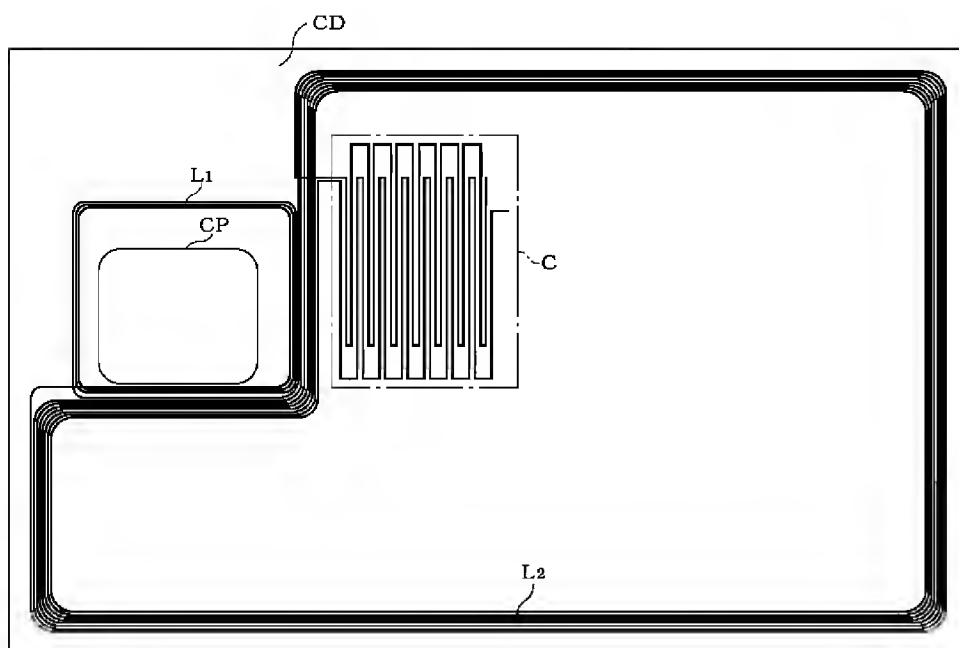
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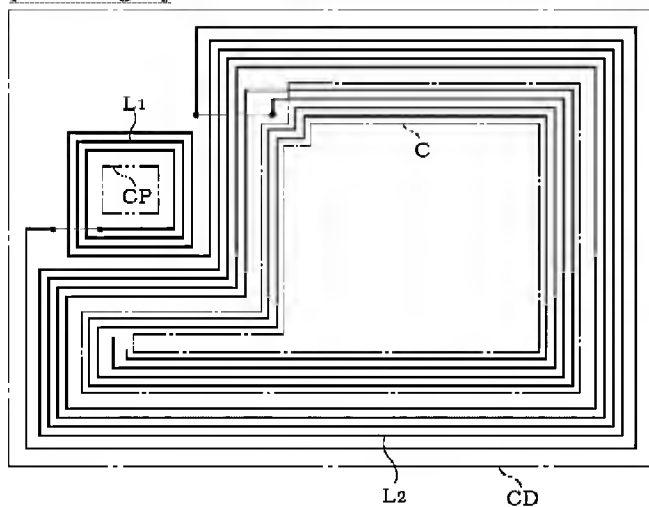
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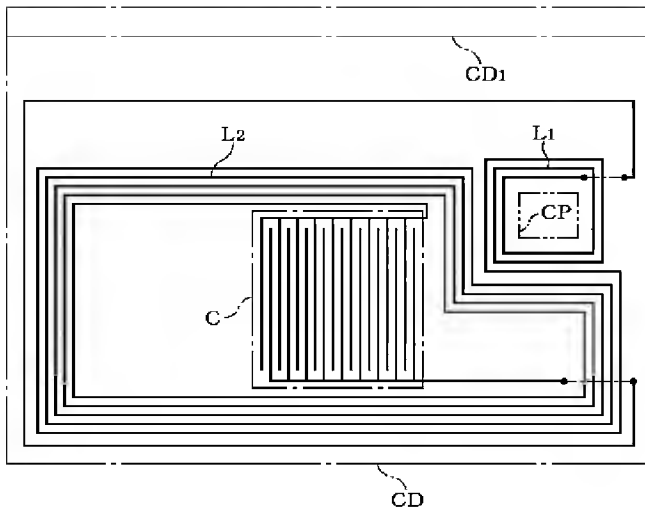
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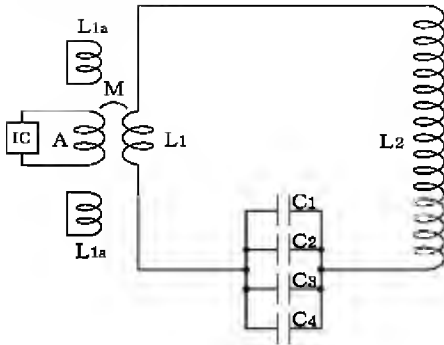
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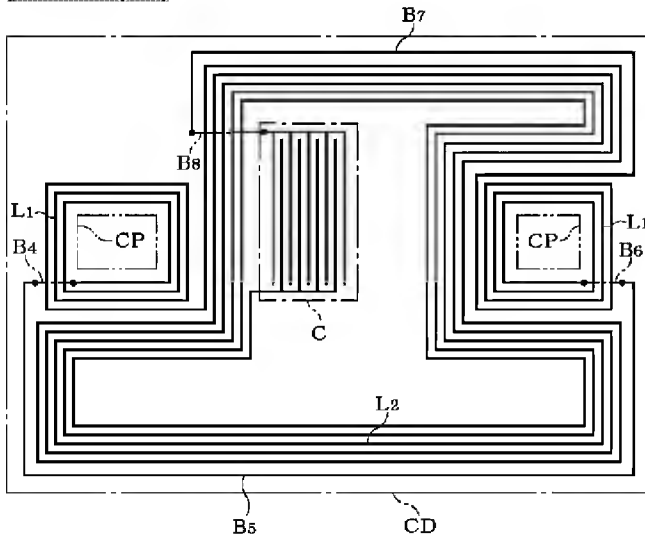
[Drawing 5]



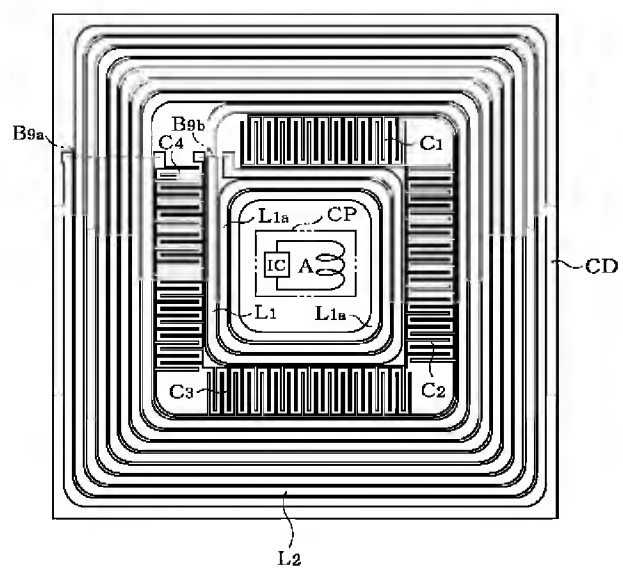
[Drawing 9]



[Drawing 6]



[Drawing 8]



[Translation done.]